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Statement of

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Administrator

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

before the

Subcommittee on HUD-Space-Science-Veterans
Committee on Appropriations
House of Representatives

Mr. Chairman and Members of the Subcommittee:

I am pleased to have this opportunity, in my first appearance before the Subcommittee, to testify in support of the President's Fiscal Year 1973 budget request for the National Aeronautics and Space Administration.

Accompanying me today are Dr. George M. Low, Mr. Willis H. Shapley, Dr. Wernher von Braun, Mr. William E. Lilly, and the program officials directly in charge of the operations of the Agency. All of these gentlemen are well known to the Subcommittee from their previous appearances.

First, Mr. Chairman, I would like to address our budget totals and some important considerations affecting the total size of the NASA budget in future years. NASA's appropriations estimates for FY 1973 total $3,379,000,000. As shown by the

table this total is at approximately the same level as the appropriations for the past two years.

(in thousands)

	FY 1971	FY 1972	FY 1973
Budget Plan:			
Research & Development	$2,542,362	$2,507,700	$2,600,900
Construction of Facilities	28,755	52,700	77,300
Research & Program Management	722,134	726,387	700,800
Total Budget Plan	$3,293,251	$3,286,787	$3,379,000
Net Adjustments	+19,368	+11,248	---
Total Appropriations	$3,312,619	$3,298,035	$3,379,000

The basic objectives and most of the programs on which our FY 1973 budget is based are the same as presented by NASA last year and approved in the FY 1972 authorizations and appropriations. With a few important exceptions--which I will discuss-- the FY 1973 estimates provide the funds needed in FY 1973 to carry forward and support the programs presented to the Subcommittee in previous years.

But the difference is fundamental. We have reconfigured our plans so that a substantially higher level of appropriations will not be required in future years to complete the programs in our FY 1973 budget and to continue over the years a useful

and significant program of new projects in space science, exploration, and practical applications, in advanced technology, and in aeronautics.

The program as planned last year would have required NASA appropriations in future years to approach $4 billion per year. Run-out costs alone, i.e., the costs to continue and complete, without new starts, the program as then planned would have risen to $3.7 billion in FY 1973 and $3.95 billion in FY 1974.

The program as now planned has estimated run-out costs of $3.37 in FY 1974, $3.3 billion in FY 1975, $3.2 billion in FY 1976, and $3.1 billion in FY 1977. What this means is that under the revised plan we will be able, by properly phasing-in the start of needed future new programs, to hold total NASA appropriations in future years to approximately the current total appropriations level in current dollars. The chart attached to my statement shows graphically the difference between the previous and present plans.

The previous NASA plan, if carried out, would in effect have "committed" the nation either to a higher NASA budget in future years, or to the waste from termination of programs in mid-stream that would result if the President and Congress found it impossible to provide the higher budgets required.

The revised plan is, I believe, more realistic, and will give the nation a good, viable, and balanced program in aeronautics and space at a cost it can afford.

The revised plan is not a commitment to a constant NASA budget in future years. Changes in the purchasing power of the dollar, as wage and price levels change, will have to be recognized. The President and Congress may decide that the program as now planned should be augmented or accelerated. But under the revised plan the program no longer contains a built-in commitment to higher budget levels. The decision can be made each year in the review of the proposed appropriations.

I strongly believe that this posture of a realistic long-term plan in which the nation's commitment is limited to budgets of approximately the current size is the proper posture for NASA from the standpoint of responsible management. I believe also that such a posture should go far in alleviating the concerns that have been expressed that in embarking on the new space programs of the 1970's we are committing the nation to a program that it cannot afford.

To achieve this posture, we have had to make some basic changes in our planning and accept yet another stretch-out of the period over which our continuing and long-term objectives

in space exploration and space science will be achieved.

SPACE SHUTTLE PROGRAM

The principal change has been in the space shuttle program. The space shuttle configuration we now plan will cost about $5.5 billion to develop, about half of what the configuration envisaged last year would have cost. My letter of January 14, 1972, reported in detail on the progress and results in our studies last year which led to the configuration concept decisions approved by the President on January 5, 1972.

As the Subcommittee knows, the objective of the space shuttle program is to develop a new type of space vehicle, one that can be used over and over like an airplane, and as the model shows, even looks like an airplane. The reasons for developing it can be summed up as follows:

-- To provide the means for routine, quick reaction, and economical access to and return from space. The shuttle will be used for most of the scientific, applications, and military missions in space in the 1980's and beyond.

-- To reduce the cost of space operations substantially. With space programs at about current levels, the total savings to NASA, DOD, and other users of space

will run to several billions over the decade of the 1980's.

-- Finally, to assure that the United States will have a continuing effective presence in space. Without it there would be no U. S. manned space flights after the Apollo and Skylab missions are completed.

Mr. Chairman, to conserve time I will not dwell longer on the shuttle. As these hearings proceed, I am sure we will be discussing in greater detail the current status of our decisions on the design of the space shuttle, our plans for proceeding with its development, and the requirements for the $200 million requested for FY 1973 in "Research and Development" and the $27.9 million requested in "Construction of Facilities." Before moving on, however, I would like to emphasize two points:

First, the $5.5 billion development cost of the space shuttle is included in the estimated "run-out" costs of our FY 1973 program cited above. All of NASA's costs in future years for putting the shuttle into operation and using it effectively can be accommodated in a total NASA program and budget at approximately the current level of appropriation, in current dollars.

Second, steps we have taken and are taking on the space shuttle in FY 1972 are fully in accord with the plan and approach for the space shuttle presented to and approved by Congress in our FY 1972 authorizations and appropriations. This plan and approach, you will recall, was that we would proceed in FY 1972 with engine development and would continue studies or initiate development of the shuttle itself, depending on the progress in the studies. We are now approaching final decisions on details of the shuttle configuration and will, of course, continue to keep the Subcommittee currently informed of significant developments and decision points as they occur.

EXPLORATION OF THE OUTER PLANETS

A second significant change in our plans of last year has been a cutback in our planned program for the exploration of the outer planets. Last year we proposed starting the development of an advanced spacecraft, called TOPS, to explore all of the outer planets--Jupiter, Saturn, Uranus, Neptune, and Pluto--during the unique opportunities for "Grand Tour" missions in the late 1970's. To meet these launch opportunities, and because of the advance technology to be used, this program would have been quite costly and imposed heavy funding

"Will loose Pluto with this new program" Nagle.

John Nagle: "Grand Tour about 1967; analysis of celestial mechanics."

Fletcher: "shuttle decision had nothing to do with the cancelling of Grand Tour."

requirements in the next few years. Partly for these reasons, the Grand Tour program, although highly attractive from many standpoints, received less than wholehearted support from some in the scientific community and the Congress, and the OMB. Fletcher

We have, therefore, reduced and redirected the program to focus in the later 1970's on Jupiter and perhaps Saturn with less expensive spacecraft. This action maintains a program of outer planet exploration and assists us in avoiding substantial increases in future NASA budgets.

NUCLEAR PROPULSION PROGRAM

A third significant change is in the nuclear propulsion program. As reported in my letter to the Subcommittee of January 24, 1972, we have decided to terminate the NERVA program for developing a 75,000-lb. thrust nuclear rocket engine. Under last year's budget we have been in a holding position in this program to see whether development of this engine should be resumed. The stretch-out in our future plans necessary to avoid large budget increases in future years served to push even farther into the future the earliest times we could hope to mount missions that would use the full size NERVA engine. This fact, together with the need to hold our budget level down in the 1970's, led us to the conclusion that

reinstatement of NERVA development could not be justified and that the existing development contracts should be terminated.

However, we have no doubt but that there will ultimately be a need for nuclear propulsion in the space program. The investment over the years in nuclear propulsion technology development and in the NERVA program has provided lasting values in preparing ourselves for the time a nuclear engine is required.

Cancellation of the Grand Tour missions has introduced the new class of future missions for which a smaller nuclear rocket engine, much smaller than NERVA, may be particularly well suited: the first missions with relatively small spacecraft, to the most distant of the outer planets--Uranus, Neptune, and Pluto. Now that we will miss the unique opportunity for the gravity assisted Grand Tour missions, a new high energy propulsion system will be needed to reach these planets. For this reason, we have included $8.5 million in our FY 1973 budget to proceed with AEC in defining a nuclear rocket engine in the 15,000-20,000-lb. thrust class and conducting the trade-off studies necessary to establish the preferred propulsion system for missions to these distant planets some time in the 1980's.

Acceleration of noise suppression kits from 4 yrs to 3. - Jackson.

AERONAUTICS

The final major change in our program from last year is the increased emphasis we are placing, within our total budget, on aeronautics. During the past year we have completed a joint study with the Department of Transportation of Civil Aviation Research and Development. This study, known as the CARD study, identified high priority needs such as noise abatement and relief of airport congestion and spelled out the impressive economic benefits resulting from this nation's position of world leadership in civil aviation. The contribution and need for research and advance technological development in aeronautics to meet these needs and maintain our position of leadership was well documented.

For example, if our request is approved, we will intensify our efforts on the QUESTOL program--the name we now give the program for the development of an experimental quiet short take-off and landing research aircraft we are starting in FY 1972. We will also begin work on an engine modification kit--using new technology developed by NASA, DOT, and industry--which can permit airlines to reduce the objectionable noise of older jet engines. We have a five minute demonstration at the end of the Statement. These are but two elements of the clearly laid out program we have developed to attack the top priority problems facing the nation in civil and military aeronautics.

We believe that this program is responsive to the strong urgings of Committees of Congress that more and better focussed attention be given to aeronautics.

Roy Jackson- charts, & tape of sounds.

CONTINUATION OF SPACE FLIGHT PROJECTS UNDERWAY

Now, Mr. Chairman, I would like to review briefly the major space flight programs approved in previous years which are included in our FY 1973 budget:

-- The Apollo program will be completed in FY 1973. Apollo 16 now scheduled for launch April 16, and Apollo 17, this December, will make the last Apollo scientific expeditions to the moon. We believe these missions will surpass even the spectacular results of Apollo 15 in adding entirely new dimensions to our understanding of the moon and its significance for a better understanding of the earth.

-- Skylab, our experimental space station, now in the crucial qualification phase of development, will be placed in orbit in 1973 for our astronauts to conduct the wide range of planned experiments in earth resources, solar astronomy, medical, and other fields.

-- Mariner 9 is now daily sending back exciting new information on the planet Mars. As I will mention

later, in a real sense we are discovering, with this information, a new planet, much different from what was known or expected from ground observations and the relatively brief glimpses from Mariners 4 and 6.

-- Viking is on schedule to make our first landings on Mars in 1976 with scientific instruments that should make another giant leap in our understanding of this planet and its similarities and differences from the earth. The most recent information from Mariner 9 has greatly increased the possibility that some form of life may be found on Mars. Navgle - more info given orally.

-- Pioneer F and G will be man's first missions through the asteroid belt beyond Mars to Jupiter and will be the first man-made objects to escape from the solar system into interstellar space. Pioneer 10 launched last Thurs. 3½ m. Km. Dec 1973 Rendezvous. carrying plaque.

-- Going in the other direction, a Mariner spacecraft will swing by Venus to Mercury in 1973, and in 1974 and 1975 Helios, our cooperative project with West Germany, will fly three quarters of the way to the sun to make the closest solar observations ever made.

-- Orbiting observatories will continue to push back the frontiers of the cosmos with their observations of

features of the universe that are invisible from the surface of the earth. OAO-2, launched more than three years ago, is still very hard at work. OAO-C, with a different and more complex set of ultraviolet measuring instruments, will be launched this summer. Development of the new High Energy Astronomical Observatory (HEAO) to look systematically at the mysterious X-and gamma-ray sources deep in the universe will proceed, aimed at launches in 1975 and 1977. We will also proceed as planned with OSO I, the advanced satellite to observe the sun, but have deferred, at least for now, work on further satellites in this series. OSO-J OSO-K

-- Last--in order in my statement but perhaps first in importance--are ~~our~~ the applications satellites:

- The launch, early this summer, of ERTS-A, the first experimental earth resources survey satellite, will be a major milestone in the development of practical uses of space. The more than 300 experiments with ERTS data planned by over a dozen agencies will represent the most massive effort to date to explore experimentally the direct uses and benefits of space for men on earth.

- The practical uses of weather satellites will continue to be pushed with the launch of the first SMS stationary weather satellite, further sensor experimentation with Nimbus satellites, and initiation this coming year of development of TIROS N--the only new space project included in the FY 1973 budget--to incorporate the advances of recent years into the nation's operational weather satellite system.
- In the communications field, advanced technology and user experiments will be conducted with ATS F, and ATS G.

Before closing, Mr. Chairman, I would like to mention several matters which I believe will be of interest to the Subcommittee.

U.S.-USSR COOPERATION

The first concerns our efforts toward more meaningful cooperation with the Soviets. As the Subcommittee has been advised, we have made what appears to be good progress in several areas. We have set up three joint working groups in the fields of near-earth space, the moon, and the planets; satellite and rocket meteorology; and study of the natural environment. We have exchanged lunar samples, and in the planetary field, we have arranged for direct teletype

communications to exchange findings of special interest by the Soviet Mars 2 and 3 and the U.S. Mariner 9 missions.

We have also had a series of detailed technical discussions on the design of compatible systems which would permit future U.S. and Soviet manned spacecraft to rendezvous and dock with each other for rescue or other purposes. There have been technical discussions of the possibility of an early experimental mission in which an Apollo spacecraft would rendezvous and dock with a Soviet Salyut-type space station. No decision has been made on conducting such a mission but we are taking the steps necessary to preserve the option for using surplus Apollo and Saturn IB hardware for this purpose.

CIVIL SERVICE PERSONNEL

The amount requested for Research and Program Management, $700.8 million, is $25 million less than the FY 1972 budget plan. This request reflects a reduction of 650 positions in FY 1973 in addition to the FY 1972 reduction of 850 made last year after our FY 1972 budget had been approved by the Congress. These reductions, in effect, represent the application to NASA of the 5% across-the-board reduction in personnel ordered by the President last August. We had hoped to accomplish these reductions by attrition, but it now seems clear that reduction-in-force actions will be necessary at almost every

NASA Center and at Headquarters.

These most recent reductions, totalling 1,500, come on the heels of the 1,500 reduction previously planned in our FY 1972 budget and yet another 1,500 reduction the year before. With our overall budget level and program now stabilized, I believe that our civil service employment should likewise be stabilized at the 26,850 position level we will reach at the end of FY 1973. Mr. Richard C. McCurdy, the Associate Administrator for Organization and Management, will be pleased to discuss with the Subcommittee the results of his study of NASA's institutional base and personnel requirements as these hearings proceed. The proper and efficient management of NASA as an institution is one of our most important continuing concerns.

IMPORTANCE OF THE NASA PROGRAM

In conclusion, Mr. Chairman, I would like to devote a few minutes to summarize our views on the importance of our programs in aeronautics and space.

In the allocation of funds to support the multitude of Federal agencies and programs each year, hard decisions are made based upon an overall consideration of national priorities and needs. And on this basis, there are some who urge sharp reductions in NASA's program. But, when we consider

the very real benefits of NASA's program--in advancing scientific knowledge, in exploration, in the practical applications of aeronautics and space, and perhaps most importantly in meeting the need for the United States to have a continuously advancing technology--and when we consider that the NASA portion of the overall Federal Budget for FY 1973 amounts to less than 1.3 percent, I am firmly convinced that NASA well justifies its present place in any objective ranking of national priorities.

Let me review some of the different kinds of benefits resulting from our programs in aeronautics and space.

In exploration and science the benefits are usually long-term in nature, but are nonetheless real. Take, for example, Mariner 9, which has been orbiting Mars for the last 3½ months and has acquired a wealth of outstanding scientific data on that planet and has unravelled a number of mysteries which have intrigued the earth-based scientists for centuries. I will take a moment to try to explain why this is important.

From Mariner 9's numerous high resolution pictures of the Martian surface, a number of close-up views of its two moons, and almost continuous measurement of the changing atmospheric conditions on Mars, a completely new picture of the planet is now emerging. It appears that both the surface

and the atmosphere of Mars are extremely dynamic. Abundant evidence has accumulated suggesting that, like the earth, Mars is volcanically active and some time during its history may have witnessed large outpourings of gases and liquids which have been the basic building blocks of life on the earth. (volcano activity areas) Calderas, faulty terrains, deep canyons, and dried-up meandering rivers clearly seen in the television pictures, all point to a continuously evolving Mars whose history may have been completely different from that of the moon and may be following that of the earth, but at a slower pace because it is a smaller planet.

A major problem facing physicists studying the earth's atmosphere at the present time is what will be the effect of changes in the earth's atmosphere on the global climate. The problem is complex for theoretical analysis because of our poor understanding of the mechanism by which a cooling or heating of the earth will influence the dynamics of the atmosphere and whether the dynamical effects may not be large enough to offset the initial change in temperature. Now, for the first time, we seem to have actually witnessed the cause and effect of this phenomenon on Mars and will be able to extend the results to gain a better understanding

of changes that may occur to ~~the~~ on earth. As you know, Mariner 9 reached Mars at a time when an extensive dust storm was raging over the whole planet. The numerous temperature and pressure measurements carried out by Mariner 9 on the atmosphere and surface of Mars during and after the dust storm will also be a direct input to our understanding of the behavior of our own earth's atmosphere.

I have taken the time to go into this, Mr. Chairman, because it shows that even our most remote activities in space have a real relevance to problems on earth.

To continue, in our space applications weather satellites, communications satellites, and, in the future, earth resources satellites -- the direct benefits can be measured almost immediately in terms of dollars, or convenience, or even in terms of human lives saved.

Then there are the direct benefits of advanced aeronautical and space technology. To meet the pressing social problems of our times requires above all a sound economy operating at a high level of employment to generate the tax revenues required at all levels of Government. To maintain such an economy in a competitive world, we must increase our productivity year after year, decade after decade. The only way in the long-term to keep increasing our productivity is through advancing our technology.

I know of no other activity which has done and can do as much to keep the U.S. strong in advanced technology as

NASA's programs in space and aeronautics. Maintenance of technological leadership is a long-term matter. It takes many years for new technology to have its effects on the economy. But the problem is before us now. In 1971, the United States for the first time had an annual trade deficit, a net total deficit of over $2 billion. But this deficit would have been three times that amount had it not been for the favorable balance of trade of almost $4 billion the United States achieved in the aerospace field.

Finally, there are many indirect benefits of NASA's programs which are often referred to as "spinoffs" or "technology transfers." Such benefits flow inevitably from our work in advanced research and development. Some are quite predictable. The relentless demands placed upon the American computer industry to meet the needs of the space program, for example, challenged that industry to advance both its hardware and the programming and contributed greatly to its dominant position in world markets.

Similarly, we know from our studies that NASA contractors having both aerospace and commercial product divisions regularly transfer the new capabilities developed under NASA contracts to their commercial product lines. For example, the Chrysler

Corporation reports that an electronic ignition system now in use in 1972 Chryslers--which system eliminates the potentially troublesome distributor and breaker points and the condenser--is a "spinoff" of technology developed in the space program. With your permission, Mr. Chairman, I would like to submit for the record the complete Chrysler report, with the observation that this company is just one of the thousands that have worked on NASA programs.

Other indirect benefits of our programs in aeronautics and space would have been less predictable. For example, a new rubber-like material, originally developed by the Jet Propulsion Laboratory during research to develop an improved binder for solid rocket propellants, has the potential of serving as a greatly improved material for patching concrete roads. This material, which drys faster and is easier to apply than present materials, is now being tested by the California Division of Highways and, I understand, will soon be tested here in the District of Columbia. May use old tires & crankcase oil in producing new product.

In the course of these hearings, Mr. Chairman, we will be glad to report further on our efforts to encourage the use of space technology in other fields and to identify the indirect benefits of our programs.

CONCLUSION

In summary, Mr. Chairman, our FY 1973 estimates support a balanced and forward-looking program in aeronautics and space which will over the years have significant benefits to the United States. In the space shuttle program, we have the key element for practical and economical future uses of space. And we have an overall program plan which does not commit the nation to a higher level of appropriations in future years.

Mr. Chairman, this concludes my prepared statement.

COMPARISON OF RUNOUT COSTS
(WITHOUT FUTURE NEW STARTS)